Committee on Resources

Witness Testimony

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My expertise and research on this issue primarily concerns water quantity and the impacts of mining on groundwater hydrology and the surface expression of groundwater, primarily springs, river, streams and riparian areas. For my research, I have used public information obtained from the Nevada State Engineer's office, the US Geological Survey, the Nevada Dept. of Environmental Protection, and the Bureau of Land Management as well as data published in environmental impact statements. My interest in water quality stems from the fact that contaminants are transported in groundwater and surface water. I will report on data collected from offices of NDEP. I will focus my discussion of the hydrologic impacts of mining on the regulatory framework for permitting contained in the current Section 3809 regulations and the need for their reform. Attached to my testimony is a paper to be published in October by the American Water Resources Association in the Proceedings of their 1997 Annual Conference and the abstract of a paper presented on September 8 at the American Chemical Society Conference in Las Vegas.

The Problem

When companies excavate open pit mines below the water table, they must dewater the surrounding aquifer so that water does not flow into the pit and destabilize the pit walls. There are four primary localized hydrologic impacts caused by such mining. First, dewatering lowers groundwater levels in the vicinity of the mine. This impacts springs and surface water by changing the flow gradient in the vicinity of the pit. I will provide two examples of this impact. A hot spring over seven miles from the Lone Tree Mine (the mine is located within two miles of the Humboldt River) went dry, presumably due to dewatering. During exploration activities in Crescent Valley, when the exploration company hit artesian water, the flow at a hot spring over five miles almost immediately decreased by ten percent.

Second, the open pit and drawdown cone around the pit represent a deficit to be made up after mining, and dewatering ceases. The pit was originally all rock and pore spaces filled with water would have made up only about 1 percent of the pit in bedrock and up to 20 percent of the pit in alluvium. After mining ceases, if the pit is not backfilled, a pit lake will form, and the amount of water in that area will be up to 95 times more than existed prior to mining. This water must come from somewhere. The drawdown cone[(1)] also represents a deficit because it primarily represents water that has been pumped and consumptively used or

otherwise lost to the local groundwater system. The two most impactful mines on local groundwater deficits are the Twin Creeks Mine northeast of Winnemucca and the Lone Tree Mine between Battle Mountain and Winnemucca. Twin Creeks will create a 460,000 af pit lake which will be the second largest manmade lake in Nevada if we include Lake Mead. The drawdown cone will be about 200,000 af so the total deficit caused by this mine is 660,000 af. The Lone Tree Mine will create a pit lake of 102,000 af and during dewatering discharge to the Humboldt River almost 1,000,000 af. This mine creates a deficit of almost 1.1 million af sitting just 2 miles from the Humboldt River.

Third, the quality of water in the pit lakes, after they form, depends on the source of water refilling them. The mining companies and BLM predict this quality using complicated geochemistry models. However, the models depend on the quality of hydrologic data, predictions of the inflow to the pit. I performed basic sensitivity analysis of the pit lake inflow at the Pipeline Deposit mine(2) and showed that very reasonable assumptions of the geology near the pit led to estimates of inflow that caused the time to refill to vary from 8 to over 100 years. The BLM predicted an inflow rate of 12 years which was used to model the chemistry in the pit. My assumptions involved increasing the complexity of the geology as represented in the model to test the simplifying assumptions use by the BLM. In other words, I more accurately characterized the system to show the major problems with the predictions. The bottom line is that the predictions are rather useless.

Fourth, the pit lakes will evaporate water in perpetuity. This represents a permanent loss of water from the flow in local basins. For example, the Pipeline Pit, at full development after the several piecemealed expansions are complete, will evaporate well over 1400 af/yr while recharge to the entire Crescent Valley is less than about 14,000 af/yr. This is ten percent of the total recharge in the valley.

The cumulative impacts of mining are rarely considered, although NEPA requires such consideration(3). For example, the Humboldt River watershed contains 18 mines that are either currently or soon to go below the water table and require dewatering.(4) Total deficits from these mines (as described above) represent 62% of the water stored in the surface aquifer of the Humboldt River(5). Natural flow in the river near Winnemucca, including both groundwater and surface water, is less than 200,000 af/yr. The total deficits in the Humboldt River basin equal more than 25 years of **the entire flow at Winnemucca**. Modeling for most of the pits suggest that refill of the pits and drawdown cones will require less than 25 years. Fortunately, I do not own water rights or property I want to develop downstream on the Humboldt River.

Quoting from a State of Nevada report: "Changes in water stored beneath the flood plains of the river system may be an important factor in controlling the magnitude of the flow in the Humboldt River"(6). Open pit mines represent a major change in storage of water beneath the flood plains; the authors of this report, written long before the advent of large open-pit mining along the Humboldt River, seem to suggest that deficits created by open pit mining represent a potential major impact to surface flows in the Humboldt River.

It cannot be overemphasized that these impacts are unprecedented in the history of mining anywhere in the world. While mining companies return large profits from underregulated mining, society is allowing a massive uncontrolled experiment on the environment of northern Nevada. It is not too late to do anything about it, but we are reaching that point. The rest of this testimony includes discussion about what the BLM should currently be doing, the needed changes in the regulatory framework, and needed mining law reform.

Federal Regulation Through 3809 Regulations

Many of the impacts discussed above could be avoided or mitigated by reclamation of the pits, including complete or partial backfilling, or through adequate bonding to either remedy or compensate individuals adversely impacted in the future. Section 3809 of Title 43 of the Code of Federal Regulations provides the BLM's regulations to govern hardrock mining. Currently, the BLM is attempting to modify, or hopefully, reform these regulations. First, I emphasize and will discuss below that the BLM, under current regulations has the authority to adequately regulate and mitigate these impacts. But regulatory reform could help them in this process as I will elaborate below.

My remarks focus on plan level operations because these cause the majority of impacts to water resources.

The BLM is required to prevent "unnecessary or undue degradation" defined as:

surface disturbance greater than what would normally result when an activity is being accomplished by a prudent operator in usual, customary, and proficient operations of similar character and taking into consideration the effects of operations on other resources and land areas, including those resources and uses outside the area of operations.(7)

That the definition specifies "surface disturbance" may allow some to argue that impacts on groundwater resources do not represent "unnecessary or undue degradation". The BLM myopically focuses on surface disturbance while ignoring the long distance impacts of drawdown and contamination. Impacts which may not occur until after mining ceases are even more difficult for the agency to consider. However, the impacts of drawdown caused by dewatering and pit refill clearly impact surface water and land. For example, drawdown has already caused sinkholes to form in Maggie Creek. It has caused springs to dry. If the flow in any streams is substantially reduced, the riparian vegetation may dry which is also a surface impact. This is clearly a surface disturbance.

However, the definition also included "resources and uses outside the area of operations". This would seem to include impacts on land away from the pit and implies impacts due to other than direct disturbance. Continuing with the definition: "Failure to comply with applicable environmental protection statutes and regulations thereunder will constitute unnecessary or undue degradation."(8) One such statute is the Clean Water Act. Surface discharges of contaminated groundwater are regulated under this act. Poor pit lake chemistry may cause downgradient springs to discharge contaminated water. If dewatering causes poor quality water to be discharged to a surface water source, a CWA violation occurs.

Nevada regulations are quite clear (if not enforced):

Bodies of water which are a result of mine pits penetrating the water table must not create an impoundment which, (a) has the potential to degrade the ground waters of the state; or (b) has the potential to affect adversely the health of human, terrestrial or avian life.(9)

The Nevada regulation is clearly "applicable" law and many pit lakes have the potential to cause such degradation. The BLM's current permitting regulations require that "[a]ll operations...comply with all pertinent Federal and State laws, including but not limited to the following"(10) and then goes on to list water quality and state "[a]ll operators shall comply with applicable Federal and State water quality standards...".(11) The referenced Nevada regulation requires prohibition of pit lakes which have "the potential to affect adversely the health of human, terrestrial or avian life"(12).

Evaporation of water from the surface of a pit lake is wasted water and should be interpreted as such and prevented by the Nevada State Engineer. Nevada State water law(13), as I read it, does not contain any passages allowing this evaporation to occur. However, these lakes will form and will waste up to more than 10 percent of a basins recharge. It is the duty of the Nevada State Engineer to prevent such waste, but to date, there has been no such enforcement.

Thus, BLM clearly is required to prevent the development of such a lake, to prevent contaminated pit lakes and evaporation wastage, even based on its' current regulations.

The State of Nevada regulates groundwater appropriation. This would include appropriation of water for dewatering purposes. But Nevada State water law does not allow groundwater withdrawals to exceed the natural recharge to a basin. Unfortunately, about fifteen years ago there was a decision that dewatering was temporary and therefore withdrawals could exceed recharge. For this reason the State Engineer allows groundwater permits that increase pumpage from a basin far beyond the recharge amounts. It is difficult to argue that projected mine lives through the year 2036 represent temporary withdrawals. Based on discussions in the previous paragraph, BLM has current authority and the requirement to prevent groundwater mining to be a result of current mining operations.

As mining developed in northern Nevada, impacts that could not have been initially expected became apparent. BLM has the legal authority and moral requirement to require changes in the plan of operations of any mine contributing to a prior unexpected impact.

If the authorized officer determines that (existing) operations are causing unnecessary or undue degradation of the Federal lands involved, the authorized officer shall advise the operator of those reasonable measures needed to avoid such degradation, and the operator shall take all necessary steps to implement those measures within a reasonable time recommended by the authorized officer.(14)

It follows that changed conditions could, and should, lead to a cessation of permitting in certain circumstances until the impacts can be adequately mitigated. We suggest that the massive cumulative impacts of mining on water resources in the Humboldt River basin require such changes in existing plans and a possible temporary cessation of permitting within certain regions of the basin. This cessation should be continued until the impacts have been adequately studied(15) and permitted. The Nevada State Engineer also has the authority(16) to require any additional studies needed to determine potential impacts thereby protecting downstream ranchers and Nevada's environment. He may disallow any additional dewatering permits until such a study has been completed. To date, he has been unwilling to require these desperately needed studies.

It is clear that the BLM has the authority in the existing 3809 regulations to adequately protect the environment from negative impacts of hardrock mining. Long distance impacts should be regulated and groundwater impacts clearly cause a surface disturbance. Nevada state law prohibits the creation of contaminated pit lakes and groundwater mining and prevents the waste of water by evaporation from pit lake; the regulations require the BLM to enforce these laws if Nevada is unable as has the State has demonstrated many times. New circumstances, such as substantial dewatering, should trigger the BLM to require changes in existing plans, cessation of new permitting, and the completion of relevant studies. But the regulations are not specific and the new regulations should provide more specifics to allow, or require, the BLM to protect water resources from the impacts of hardrock mining. After discussing the types of

mitigation that BLM could require, I will recommend specific changes in the regulations.

Potential Mitigation

There are three ways to mitigate groundwater quantity impacts and some of the long-term losses. One is to require pit backfill, at least to the point that groundwater inflow will create a pit lake. Backfilling the pit to the level of the groundwater would also decrease the deficit caused by the pit itself. This would decrease the total deficit in the Humboldt River basin discussed above from 5,000,000 af to about 3,000,000 af. It would also eliminate much of the long-term, permanent evaporation loss. BLM has required backfill at several small projects(17), but these would have had only small impacts on long-term deficits. Too often, the BLM argues that backfill is too costly. This is not a legitimate argument since one of BLM's responsibilities is to prevent "unnecessary and undue degradation" and there is no requirement in Section 3809 that the BLM consider the cost of the mitigation. BLM cannot prohibit mining, but there is no requirement that BLM not require justified costly mitigation. If a requirement can be met by most of the industry, the fact that it may render some operations unprofitable is not, and should not be the BLM's concern. Another argument against backfilling is that backfill may cover resources that could be recovered in the future if gold prices go up or additional discoveries are made. The fact is that once a pit lake forms, the low quality of the water would probably prevent discharge to any surface water and the resources covered would be essentially lost(18). This is not a legitimate argument.

A second solution is to require recharge of dewatering water. Unfortunately, it is only applied at mines which are furthest from the Humboldt River and which have the least potential for significant impacts on overall basin water resources. This includes Echo Bay and the Pipeline Deposit mine. We support the concept, but it is not as good an answer as the environmental documents would suggest. For example, all of the dewatering discharge, minus consumptive use and evaporation, at Pipeline would be recharged. But faulty hydrologic measurements and groundwater models led to a prediction that less than 120 acres of basins with rotating use would suffice. There would only be 50 af/y of loss to evaporation. Recently, there was a plan change and the recharge ponds will triple in size and evaporation loss will increase by 16 times. My groundwater analyses shows that the usefulness of groundwater recharge in this basin is much less than predicted because of the sensitivity of certain hydrologic parameters in the model to very small changes. Also, the BLM does not require recharge if it is too costly. For example, at the Lone Tree Mine, recharge is feasible, but a ten-mile canal would be required. Instead, almost 1,000,000 af of water will discharged to the Humboldt River and lost to the middle Humboldt river basin. Recharging as proposed by Great Basin Mine Watch basin would allow water to reach the Humboldt River at the time the pit is refilling.

The third and perhaps most essential aspect of preparing for future problems is to require adequate bonding. Current bonding requirements(19) are generally based on area of land disturbed(20), however the BLM does have significant leeway in this matter. The operator, "[a]t the discretion of the authorized officer, be required to furnish a bond in an amount specified by the authorized officer". This suggests that upon documenting potential impacts or uncertainty in the prediction of impacts, the authorized BLM officer should require adequate bonding to remedy problems that occur after operations have ceased. The requirement should include a provision to allow the BLM to hold the bond for many years after the mine closes because of the time for pit lakes to refill(21).

The cumulative impacts occurring in the Humboldt basin present a unique problem for bonding. Because offsite impacts may not be assignable to a specific mine or company, there needs to be an escrow account into which all mine deposit some bonding and from which all impacted parties would be able to receive a

remedy. It is because of this problem that the Sierra Club supported legislation in the Nevada State Assembly to require a fee for certain rates of dewatering. A mitigation and research fund would have been established to provide for research of dewatering problems and to compensate or remedy impacted persons in the future.

Suggested Regulatory Changes

While the BLM currently has authority to require most needed changes in the permitting procedures, there are reforms to 3809 Regulations that would make it easier for the agency to enforce existing environmental laws. There is also pending legislation, the Rahall bill(22), in the House of Representatives referred to this committee that we strongly support and will briefly discuss below. It must be remembered that BLM is free to require any technology or procedure necessary to avoid "unnecessary and undue degradation" of public lands as long as the majority of the industry can comply. BLM is not required to consider the economics of the situation or to insure industry or company profits. The remainder of this testimony will include some specifics regarding 3809 regulations and how they may be improved to accommodate the major water resources impacts documented above.

In order to prevent "unnecessary and undue degradation", the regulations should clarify what is meant by "not unduly hinder such activities but will assure"(23) that they not degrade public lands. These statements are contradictory in that it may be that to "assure" there will be not be "unnecessary or undue degradation", some operations will be unduly hindered. As argued above, BLM need not consider economics, therefore there is no reason to prevent the hindrance of some activities.

The objective that provides "for the reclamation of disturbed areas"(24) should be amended to clarify that "disturbed areas" include areas that are impacted both directly by surface disturbing activities and indirectly by dewatering, contamination, spills, etc.

The definition of reclamation(25) should be amended to include a provision requiring the restoration of the natural hydrology to the extent possible.

The definition of "unnecessary or undue degradation"(26) should be amended to include disturbance to local and regional hydrologic resources. This should define degradation to include the drying or contamination of springs, streams, seeps, and wetlands, both onsite and offsite due to indirect impacts linked mining activities.

Procedures for requiring the modification of a plan based on changing conditions should be clarified. Currently, "[o]perations may continue...,unless the State Director determines that the operations are causing ...degradation to the land"(27). Also, if the authorized office determines that operations are causing ... degradation of the Federal lands involved, the authorized officer shall advise the operator of those reasonable measures needed to avoid such degradation, and the operator shall take all necessary steps to implement those measures within a reasonable time..."(28). If the changes in definition of unnecessary and undue degradation are changed as suggested above, the State Director or authorized officer could require changes based on impacts on offsite water resources. We suggest that the regulations be changed to clarify when changing conditions warrant a change in operations. A single mine in a basin does not have the same impact as several; it seems equitable to require changes throughout the basin rather than to put all of the mitigation requirements on the last mine to permitted. For example, the existing Pipeline Deposit mine does

not have the impacts to Crescent Valley as it, the Pipeline expansion, and development of resources currently being explored about five miles across the valley would have on the valley and people living therein. BLM needs to be able to implement changes to all operations as companies propose future operations.

Bonding requirements should be amended to allow the amount of bond to be based on the potential for offsite impacts on water resources, including those impact that may be manifest on subsurface resources. "[T]he authorized officer shall consider the estimated cost of reasonable stabilization and reclamation of areas disturbed."(29) Some may interpret this to not include subsurface or offsite resources, therefore the bonding requirements should be changed to adequately reflect the impact of mining on the environment. Also, there should be a provision to allow a portion of the bond to be held beyond the actual surface reclamation of the mining site.(30) This portion would be based on the time for offsite impacts on water resources and other resources. It is impossible to ascertain "on inspection" that the offsite impacts will not occur. It is important to note that the drawdown cone created around a mine for dewatering will continue to expand after dewatering ceases. For example, the drawdown cone, as represented by the 100 foot drawdown line, around Twin Creeks will expand for almost thirty years after mining ceases. The operators of this mine should remain responsible for the effects caused by the expanding drawdown cone.

A final recommendation needs to address the issue of noncompliance. When the BLM issues a Record of Decision based on a Final EIS, the operator is responsible for carrying out the Plan as specified. When the operator makes changes without BLM analysis and approval, the BLM should have the authority to levy fines and suspend operations. For example, a local mine built a pipeline across public land when the EIS specifically disallowed this construction. BLM needs more authority to deal with these problems on a day-to-day basis.

As stated above, the Sierra Club and Great Basin Mine Watch strongly support enactment of the Rahall Bill, HR 253, the Mineral Exploration and Development Act of 1997. Many of the concerns and impacts discussed above would be remedied. Many of the suggested regulatory changes would be codified. It specifically refers to the protection of water resources. It establishes a fund to clean up degradation to surface and, importantly, water resources caused by previous mining.

Conclusion

The gold mining industry has expanded from 1 million ounces in 1980 to 13 million ounces today. This is a remarkable expansion and has led to rapid growth in rural Nevada and other states. Mining is a very important part of the economy of Nevada and should remain so. But future citizens of northern Nevada, ranchers, farmers and cities, should not be paying the debts created by present day mining. Denying these impacts is tantamount to burying our heads in the sand. We are requesting baseline standard to protect the environment of northern Nevada and the western United States. "Baseline standards set on an industry-wide level ensure that reasonable environmental regulation is bounded not by the economic travails of companies on the edge of profitability seeking minerals of questionable value, but by a societal balancing of our potentially contradictory desires to preserve the public lands while simultaneously extracting valuable minerals from them."(31) Preferably these changes would occur through enactment of HR 253, but strong changes in the Section 3809 regulations would be a major step in the right direction.

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FOOTNOTES

1. Pumping from a well, or a series of wells around an open pit, causes groundwater to flow toward the point of removal. A gradient toward the mine is created because groundwater flows downhill toward the mine. Viewed in three dimensions, the surface of the water table resembles a cone.

2. Paper presented to the American Chemical Society, see attachment.

3. Most of the data presented in this paragraph are documented in the attached paper to be published by the American Water Resources Association.

4. Personal communication from the Nevada Bureau of Mines.

5. There are approximately 5,000,000 af of deficit being created and 8,000,000 af of storage in the aquifer. Since the writing of the attached article, two additional mine proposals, Leeville and the Gold Quarry Expansion, have increased our estimate of the deficit.

6. Eakin, T.E. and R.D. Lamke, 1966. Hydrologic Reconnaissance of the Humboldt River Basin, Nevada, Water Resources Bulletin No. 32. State of Nevada, Dept. of Conservation and Natural Resources, Carson City, NV.

7. 43 CFR 3809.0-5(k).

8. 43 CFR 3809.0-5(k).

9. NAC 445.24352

10. 43 CFR 3809.2-2.

11. 43 CFR 3809.2-2(b).

12. See Note 9.

13. NAC Chapters 532 to 538, Chapters 540, 543 and 544.

14. 43 CFR 3809.1-8(b).

15. There is currently an ongoing study by the US Geological Study of impacts in the Humboldt River basin. It is a nine-year study currently funded by the industry for just the first three years. I know of no additional funding for this study which means it will cease after three years of data collection.

16. NAC 533.368

17. These include Florida Canyon east of Lovelock and Denton Rawhide northwest of Gabbs. Backfill was required but was convenient due to the sequential pits being mined.

18. This is the case at the Arimetco Pit outside of Yerington, NV. The mixing ratio is 22:1, I believe, which means the mine could be pumped into the Walker River at rates such that pit water would be less the 1/22 of the river water.

19. 43 CFR 3809.1-9.

20. "In determining the amount of the bond, the authorized office shall consider the estimated cost of reasonable stabilization and reclamation of areas disturbed." 43 CFR 3809.1-9(b). I will note that the BLM required a bond at the Pipeline Deposit of about

$1,000,000 (I cannot locate my copy of the Record of Decision).

21. Estimated times to refill vary from 12 years at Pipeline to over 100 years at Gold Quarry. These estimates are quite uncertain. See Note 2.

22. HR 253, the Mineral Exploration and Development Act of 1997

23. 43 CFR 3809.0-2(a).

24. 43 CFR 3809.0-2(b).

25. 43 CFR 3809.0-5(j).

26. 43 CFR 3809.0-5(k).

27. 43 CFS 3809.1-7(c)(4).

28. 43 CFR 3809.1-8(b).

29. 43 CFR 3809.1-9(b).

30. For example, "[w]hen all or any portion of the reclamation has been completed in accordance with the approved plan, the operator may notify the authorized officer that such reclamation has occurred and that she/he seeks a reduction in bond or Bureau approval of the adequacy of the reclamation" 43 CFR 3809.1-9 (f). This section continues to prescribe that the BLM shall return the bond.

31. Graf, M., 1997. Application of takings law to the regulation of unpatented mining claims. Ecology Law Quarterly 24:57-130.

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